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332 THE PUBLIC HEALTH IMPLICATIONS OF DEFINING EARLY OSTEOARTHRITIS: THE TIP OF THE ICEBERG

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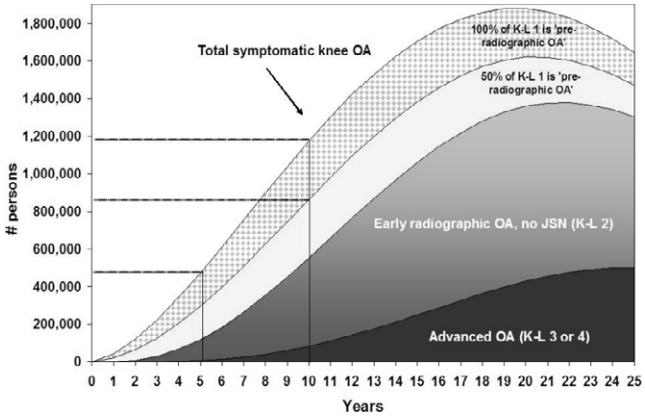
Purpose: Defining OA based on sophisticated imaging methods will assist in identifying candidates with early, pre-radiographic OA for pharmacologic treatment. However, it will also increase the total number of persons diagnosable with osteoarthritis, with implications for projected disease specific costs and disability. Our objective was to forecast the number of new OA cases diagnosed among radiographic OA-free, asymptomatic persons aged 55−64 years in the US.
Methods: We used NHANES III data to estimate the number of persons 60−64 years of age who were OA-free (K-L 0, no knee pain), stratified by obesity (cut-off BMI = 30). The total population of persons 55−64 years of age was obtained from US Census (2000) data. Annualized incidence and progression of symptomatic OA were derived from the Johnston County (JoCo) OA Project and calibrated to published literature. Mortality was derived from US life tables. The number of persons with any new diagnosable knee OA over the next 25 years was estimated using the Osteoarthritis Policy Model (OAPol), a comprehensive computer simulation model of the natural history and clinical management of knee OA. OA cases were further stratified by severity of disease: early radiographic OA (K-L 2) and advanced OA (K-L 3, 4). Assuming that some K-L 1 patients have cartilage degeneration detectable by more sophisticated imaging modalities such as MRI, we designated 50% of patients with K-L 1 as 'pre-radiographic OA' in the base case analysis. In sensitivity analyses we varied that proportion from 0–100%.
Results: Among 12,995,054 OA-free persons with mean age 60, 117,781 will develop definite (K-L > 1) radiographic OA within 5 years. Assuming 50% of persons with knee pain with K-L 1 have pre-radiographic OA, the number of incident cases will be increased 2.5 times, up to 295,875. Assuming 100% of persons with K-L 1 have pre-radiographic OA, the number of incident cases will reach 473,969. At 10 years, among those who survive, the number of persons with definitive OA (K-L 2, 3, 4) will reach 552,929, with 82,913 of having advanced OA. Adding 50% of persons with K-L 1 to the pool of knee OA patients will bring the number of new OA cases to 864,204. Including all symptomatic K-L1 persons will double the number of new symptomatic OA cases to 1,175,478.



Conclusions: A substantial number of OA-free persons will develop knee OA over time. Half of new cases over the next decade will have early OA, detectable by MRI but not by plain radiograph. If substantial number of these cases are diagnosed, the health care system will be further stressed with the additional costs of OA management. Using separate criteria for defining OA and for monitoring OA progression may help to prevent this burden.

333 SERUM LEVELS OF VITAMIN D, WINTER SUN EXPOSURE, KNEE RADIOGRAPHIC OSTEOARTHRITIS, AND KNEE CARTILAGE LOSS IN OLDER ADULTS: THE TASMANIA OLDER ADULTS COHORT (TASOAC) STUDY

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Purpose: To determine the associations between serum levels of vitamin D, winter sun exposure, radiographic osteoarthritis (OA), and knee cartilage loss cross-sectionally and longitudinally in older adults.
Methods: T1-weighted fat-suppressed MRI on right knee was performed in randomly selected subjects at baseline (n = 978, mean 62 years, range 51−81, and 50% female) and 2.9 years later (n = 419). Knee medial and lateral tibial cartilage volume were measured. Serum 25-hydroxyvitamin D [25 OHD] was assessed by radioimmunoassay and radiographic OA was assessed using the OARSI atlas.
Results: The mean 25OHD level in this sample, which is significantly associated with winter sun exposure, was 52.6 nmol/L at baseline (range 13 to 119 nmol/L). The mean change per annum was +0.85 nmol/L (range −26 to +27 nmol/L). At baseline, in multivariable analysis, serum 25 OHD was significantly associated with knee cartilage volume at medial and lateral tibial sites (β per unit: +2.1 and +2.3 mm^3, respectively; all $P < 0.05$), so was winter sun exposure (β per grade: +28 and +54 mm^3, respectively; all $P < 0.05$). Vitamin D deficiency (defined as vitamin D of <50 nmol/L, 45% prevalence) was associated with moderate to severe joint space narrowing in the medial tibiofemoral compartment at both knees, and negatively with knee cartilage volume at both medial and lateral tibial sites (deficiency vs no deficiency: −155 and −88 mm^3, respectively; all $P < 0.05$). Longitudinally, vitamin D deficiency predicted loss of medial tibial but not lateral tibial cartilage volume over 2.9 years, whereas vitamin D levels as a continuous variable were significantly associated with change in both medial and lateral tibial cartilage volume (β per unit: +0.05% and +0.04% per annum, respectively; all $P < 0.05$). Changes in vitamin D levels were also positively associated with change in medial tibial cartilage volume.
Conclusions: This study demonstrates significant associations between serum levels of vitamin D obtained mainly from sun exposure, radiographic OA, and increases in knee cartilage volume which are best observed using the whole range of vitamin D rather than predefined cut-points. This implies that vitamin D supplementation may prevent and/or retard cartilage loss in knee osteoarthritis.

334 OBSERVER AGREEMENT ON ROENTGENOGRAPHIC STAGES OF COXARTHROSIS AND INDEXES OF ACETABULAR DYSPLASIA: A PRELIMINARY STUDY FOR THE MULTI-CENTER SURVEY

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Purpose: There are no nationwide data on coxarthrosis in Japan; hence we are preparing a multi-center survey. Many patients are considered to be secondary to acetabular dysplasia in this country. Thus, we will include not only roentgenographic stages of coxarthrosis, but also indexes of acetabular dysplasia as assessment content. Because of the need for reliable data, we conducted this preliminary study of observer agreement on these items.
Methods: *Study 1*: One of the authors collected radiographs of the hip joints of 8 patients with various findings of coxarthrosis. A set of duplicated films were sent to 12 institutions. At each institution, one of the authors evaluated the stage of coxarthrosis and calculated five indexes of acetabular dysplasia, namely the acetabular angle, the center-edge (CE) angle, the acetabular roof obliquity, the acetabular head quotient (AHQ), the approximate acetabular quotient (AAQ).

For the coxarthrosis stage, we employed the classification by the Japanese Orthopaedic Association's committee. It defined five groups: almost normal, prearthrosis, the initial stage, the advanced stage, and the terminal stage. The committee focused on three roentgenographic features, namely the width of the joint space, the structure of bony architecture, and the shape of the acetabular roof and the femoral head. One of the authors, whose institution did not participate in film reading, performed the statistical analysis. On the coxarthrosis stage, he computed the value of the kappa statistics and evaluated the strength of observer agreement. On the roentgenographic indexes, he set up a mixed linear model to calculate the coefficient of variation. Based on this premise, he calculated the coefficient of variation using the analysis of variance (ANOVA).
Study 2: To overcome the difficulty in staging coxarthrosis, we defined the description of stages from our own point of view and selected typical radiographs for reference. The same 12 authors assessed the roentgenographic stage on the same radiographs again 1 month after *Study 1*.
Results: *Study 1*: (a) Roentgenographic stages of coxarthrosis. Disagreement was most apparent among the three groups of almost normal, prearthrosis and the initial stage. Moreover, several observers classified some hips as "almost normal or prearthrosis". Considering the power of statistical analysis, we dealt with these two categories as one unit. Consequently, the kappa statistics was calculated as 0.448 and the strength of agreement was evaluated as *Moderate.* (b) Roentgenographic indexes of acetabular dysplasia. The value of coefficient of variation was smallest in the acetabular angle and increased in the following order; the AHQ, the acetabular roof obliquity, the CE angle, and the AAQ.
Study 2: The value of the kappa statistics was calculated as 0.600.
Conclusions: For the multi-center survey, clear description of the stages of coxarthrosis and selection of appropriate indexes may be helpful for collecting dependable results.

336 USING ESCAPE ANALGESIA DURING AN OSTEOARTHRITIS TRIAL (OA): CORRELATION WITH PAIN SCORES & ITS RELATION TO TRIAL RESULTS

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Purpose: Trials in OA examining pain outcomes often allow use of escape analgesia, which may minimize treatment (Tx) differences. Little is known about the pattern of escape analgesia use & its relation to pain in such trials. Using data from a null randomized cross-over trial of shoe inserts (SIS) for pain Tx of OA where escape analgesia was permitted & documented by daily diaries, we describe the pattern of analgesic use, its correlation with pain scores & if there was a difference in escape analgesic usage between Tx & placebo. Previous studies have not had detailed information that would permit comprehensive evaluation of the quantity of analgesia used & its relation to pain
Methods: During the SIS trial, subjects recorded daily pain medication use via a diary which was collected at each study visit. All of the 90 randomized subjects who had at least 1 visit (maximum 4 visits) with both a completed diary & WOMAC pain subscale (n = 77) were used in the analysis. Analgesics, NSAIDS & COX-2 meds used 7-days prior to study visit (to reflect the same recalled time period of the WOMAC pain VAS subscale) were transformed to acetaminophen equivalencies (AEq). AEq transformation was based on methods used by Allen (JAGS 51:534 2003). We evaluated the correlation between pain score & AEq use with a Spearman rank test & tested the difference between Tx & placebo in escape analgesia with a Wilcoxon paired signed rank test

Table 1: WOMAC Pain & medication usage (n = 77 Subjects)

WOMAC pain,	% visits	Treatment visits		Placebo visits	
past 7 days (range 6–489)	taking meds	# visits	median MG/ day of AEq	# visits	median MG/ day of AEq
<100	52%	32	46	30	164
100–199	54%	45	93	24	58
200–299	65%	34	223	62	429
300–399	77%	30	650	18	650
400–489	77%	6	1,433	7	929
Total	62%	147	325	141	371

Results: Table 1 highlights AEq use stratified by WOMAC Pain score & visit type. The direct correlation between WOMAC pain & AEq for the Tx & placebo visits was 0.25 (p = 0.03) & 0.26 (p = 0.03) respectively. Wilcoxon paired signed ranked test indicated there was no significant difference in analgesic use between Tx & placebo (p = 0.59). Since Pain score & analgesic use were not inversely related, analgesics did not reverse any effect of treatment.
Conclusions: Pain score & analgesic use were modestly correlated, but analgesic use did not differ between Tx & placebo therefore did not affect the directionality or magnitude of the Tx effect.

337 FACTORS THAT MEDIATE THE RELATIONSHIP BETWEEN RACE AND PATIENT PREFERENCE FOR ELECTIVE JOINT REPLACEMENT

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Purpose: There are marked racial/ethnic differences in the utilization of total joint replacement (TJR) for osteoarthritis (OA). Racial differences in patient preference may be an explanation for the observed variation in utilization rates, but the factors that mediate the relationship between patient race and preference for joint replacement (JR) have been understudied. Therefore, we sampled primary care patients who were clinical candidates for JR to examine potential mediators of the relationship between race and patient preference for TJR.
Methods: The sample consisted of 894 veterans (451 African-American [AA], 443 white) 50 years of age or older who receive primary care in two VA Medical Centers and had moderate to severe hip or knee OA as indicated by WOMAC score >39. We used the previously validated Hospital for Special Surgery Joint Replacement Expectations Survey (JRES) to assess patients' expectations for pain relief, functional improvement, and psychological well-being after surgery and a previously published willingness question to assess patient preference. Structured interviews were used to collect information on demographic, psychosocial (health literacy level, social support, mental health well-being, pain coping, religiosity, and risk preference), and patient knowledge regarding JR. We a priori identified variables as covariates (age, income, educational level, WOMAC score and SF-12 mental status subscale) and others as potential mediators (knowledge, JRES, social support and pain coping). We performed bivariate analyses to examine the relationships between race, patient preference, and potential mediators. Those factors associated with both race and preference were analyzed using multiple logistic regression modeling preference as a function of race and the potential mediators, adjusted for patient covariates. Non-significant mediator variables (P > 0.05) were removed using backwards stepwise-selection. Comparison of the adjusted race effect in this model to the unadjusted race effects without the mediator variables were made to assess whether these variables mediated the relationship between race and patient preference. All models were adjusted for site of study.
Results: In this sample, AA patients were slightly younger (P < 0.001) and reported lower educational level (P < 0.001); lower household income (P < 0.001); and lower literacy level (P < 0.001). White patients reported higher preference for JR (72% vs 60%, P < 0.001); were more likely to have received a referral for surgery (32% vs 26%, P = 0.05); and less likely to have tried prayer to treat their chronic pain (56% vs 73%, P ⩽ 0.001). Compared to patients with high preference for surgery, those with low preference had lower scores on social support scale (P < 0.001); pain coping measure (P = 0.04); and knee and hip JRES (P < 0.001 for both). They also reported less understanding of JR and expected longer hospital stay, more pain and difficulty walking after JR surgery, were less likely to report having had a discussion with a doctor about surgery, and less likely to have received a recommendation for surgery (P ⩽ 0.005 for all).
AA to white unadjusted odds ratio (OR) for willingness to consider surgery (preference) was 0.69 (95% CI = 0.51−0.93) and was unchanged after adjusting for patient covariates. However, after the addition of the statistically significant potential mediators (patient knowledge, JRES and social support), the OR became 0.88 and was no longer statistically significant (95% CI = 0.62−1.24).
Conclusions: In this sample, the relationship between patient race and preference for JR is mediated by patient knowledge and expectations regarding surgery and social support.

338 DIABETES AND SITE-SPECIFIC OSTEOARTHRITIS

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Purpose: Diabetes can affect the musculoskeletal system in a variety of ways. Hormone disturbances have been associated with early cartilage